

Application No. 10/613,268  
Response to FINAL Action of October 14, 2005

**Remarks:**

1. Claims 1 through 46 were originally presented. New claims 47 through 53 were added in response to a first office action faxed to the Office on September 16, 2005. Claims 35, 40, and 42 were canceled without prejudice in the same response. No claims are added, canceled, or amended in this paper. Therefore, claims 1 through 34, 36 through 39, 41, and 43 through 53 remain pending.

2. In this Office Action, the Examiner has allowed claims 29-34, 36-39, 41, 43, 44, and 47-51. Claims 11-13, 15, 16, 22-24, 52 and 53 are objected to as being dependent upon a rejected base claim, although deemed to be allowable if re-written in independent form including all the limitations of the base claims and any intervening claims. Claims 1, 2, 4, 17, 19, 25, 26, 28, 45 and 46 are rejected. Claims 1, 2, 4, 17, 19, 25, 26, 28, and 46 stand rejected under 35 U.S.C. 103(a) as being unpatentable over *Tabin* (U.S. Patent 5,038,067). Rejected claims 2, 4, 17, 19, 25, 26 and 28 are all dependent on rejected claim 1. Rejected claim 46 is independent. Independent claim 45 stands rejected under 35 U.S.C. 103(a) as being unpatentable over *Tabin* in view of *Dowell et al.* (U.S. Patent 5,899,958).

3. As noted, independent claims 1 and 46 stand rejected under 35 U.S.C. 103(a) as being unpatentable over *Tabin*. In particular the Examiner states: "Tabin figure 1 shows a piezoelectric ceramic element #2 with appropriate electrodes, impedance matching layer #6 and a stainless steel impact resistant layer #19 covering the impedance matching layer."

4. Applicant respectfully traverses this rejection and requests that the Examiner reconsider and withdraw his rejection in this regard. Independent claims 1 and 46, as amended in the prior response to office action, both recite an acoustic sensor comprising "an impact barrier layer" (emphasis added). As stated in the original specification, one of the intended uses of the inventive acoustic sensor is in logging while drilling tools. The impact barrier layer is intended to protect the sensor from damage during inevitable collisions with the borehole wall and/or rock cuttings in the drilling fluid (as described in Paragraph [0056] of the original specification). Such impacts are known in the art to cause various data anomalies and even damage to the sensor itself in prior art sensor arrangements. Provision of an impact barrier layer,

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as recited in claims 1 and 46, having sufficient mechanical strength and wear resistance to minimize such damage, can advantageously prolong the life of acoustic sensors utilized in downhole environments.

5. *Tabin* has no teaching or suggestion of an impact barrier layer, as recited by Applicant in claims 1 and 46. To the contrary, *Tabin* discloses a sensor comprising a chemical barrier layer. That *Tabin* discloses a chemical barrier layer, rather than an impact barrier layer, is clear for example, at column 4, lines 24-29:

The layers [coupling layer(s)] may be provided with an integral or separately formed protective membrane resistant to aggressive chemicals; for example, the coupling layer may be machined and covered by a thin membrane 19 in the form of a protective layer of impervious material such as stainless steel (Emphasis added).

Note that the barrier layer 19 in *Tabin*'s Figure 1 is a "thin membrane" that is "resistant to aggressive chemicals" and made of an "impervious material". Clearly the intent of such a barrier layer is to prevent ingress of aggressive chemicals into the heart of the sensor.

6. There is no teaching in *Tabin* of an impact barrier layer (i.e., a barrier layer to protect an acoustic sensor from mechanical shock or physical impact). Further, there is no suggestion in *Tabin* to modify the disclosed chemical barrier layer to function as an impact barrier layer. Indeed, there could be no expectation of success to make such a modification. See MPEP § 2143. In fact, the use of a barrier layer consisting of a "thin membrane" may be fairly said to teach away from an impact barrier layer. No one of any skill in the acoustic sensor arts or downhole drilling arts would expect a "thin membrane" (no matter what the material of construction) to provide impact resistance. Moreover, an acoustic sensor including a "thin membrane" protective layer would not be expected to be serviceable in applications (such as LWD applications) in which impacts to the front face of the sensor are common.

7. Moreover, *Tabin* shows no recognition of the problem faced by the Applicant, which, as described above, was that of providing impact resistance to the front face of an acoustic sensor. On the contrary, as also described above, *Tabin* was concerned with

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susceptibility of prior art transducers to aggressive chemicals. This is further spelled out in both the background and summary sections of *Tabin*. For example, in the background section, *Tabin* points out that a drawback of prior art transducers is that they have been found to be susceptible to "certain industrial environments involving high temperatures and/or chemically aggressive atmospheres" (column 1, lines 40-42), which lead to "unacceptably rapid deterioration in service" (column 1, line 46). Thus, an object of the *Tabin* invention was to "provide a transducer... better suited to use in high temperature and chemically aggressive environments" (column 2, lines 53-58).

8. Column 4, lines 29-32 of *Tabin* state: "The protective membrane may be specified so as to meet regulations applicable to transducers for operation in explosive atmospheres." In isolation, the above statement may appear to suggest an impact barrier layer. However, it should be pointed out that no mention is made of physically withstanding an actual explosion or the mechanical requirements that would be necessary to do so. In fact, the entirety of *Tabin* is void of any such teaching. In context, the above statement about "explosive atmospheres" follows immediately after the statement quoted in Paragraph 4 of this response in which *Tabin* teaches a "thin membrane" that is "resistant to aggressive chemicals" and made of an "impervious material". Therefore, understood in its proper context, the statement quoted above in this paragraph must be referring to particular chemically aggressive environments (namely those including "explosive atmospheres"). It would clearly be understood to those of ordinary skill in the art that "explosive atmospheres" are often highly oxidizing (corrosive) and extremely chemically aggressive and that such atmospheres present a most severe challenge for a chemical barrier layer. Thus, Applicant submits that there is no teaching or suggestion of an impact barrier layer in column 4, lines 29-32.

9. Accordingly, Applicant respectfully submits that independent claims 1 and 46 are patentably distinct over *Tabin* alone or in combination with any other art of record. It follows that rejected dependent claims 2, 4, 17, 19, 25, 26 and 28 must also *a fortiori* be allowable, since they depend from allowable claim 1 and carry with them all the elements of claim 1 to which they ultimately refer.

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10. As noted above, independent claim 45 stands rejected under U.S.C. 103(a) as being unpatentable over *Tabin* in view of *Dowell et al.* Applicant respectfully requests that the Examiner reconsider this rejection and withdraw it also. Independent claim 45, as modified in the prior response to office action, also recites an impact barrier layer. As shown in paragraphs 4 through 9 above, *Tabin* lacks teaching or suggestion to modify, with any reasonable expectation of success, its disclosed chemical barrier layer to provide an impact barrier. Nothing in *Dowell et al.* provides the teaching or suggestion that *Tabin* lacks. Accordingly, claim 45 is patentable.

11. The Examiner states in the Office Action that claims 11-13, 15, 16, 20-24, 52 and 53 are objected to as being dependent on a rejected base claim. As shown in paragraphs 4 through 10 above, the independent claims to which these dependent claims ultimately refer (claims 1 and 45) are both patentable. Applicant therefore respectfully requests that the Examiner withdraw his objections to these dependent claims.

Applicant believes, in view of the foregoing remarks, that all pending claims are allowable, and that this application is now in full condition for allowance, which action Applicant earnestly solicits. Should the Examiner have any questions, or believe that a telephone interview may expedite the further examination of this application, the Examiner is requested to contact the undersigned at the telephone number shown below.

Respectfully submitted,

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